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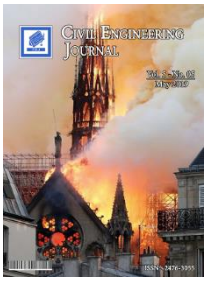

Influence of Glass Fibers on Mechanical Properties of Concrete with Recycled Coarse Aggregates

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Abstract

Despite plain cement concrete presenting inferior performance in tension and adverse environmental impacts, it is the most widely used construction material in the world. Consumption of fibers and recycled coarse aggregates (RCA) can add ductility and sustainability to concrete. In this research, two mix series (100%NCA, and 100%RCA) were prepared using four different dosages of GF (0%GF, 0.25%GF, 0.5%GF, and 0.75%GF by volume fraction). Mechanical properties namely compressive strength, splitting tensile strength, and flexural strength of each concrete mixture was evaluated at the age of 28 days. The results of testing indicated that the addition of GF was very useful in enhancing the split tensile and flexural strength of both RCA and NCA concrete. Compressive strength was not highly sensitive to the addition of GF. The loss in strength that occurred due to the incorporation of RCA was reduced to a large extent upon the inclusion of GF. GF caused significant improvements in the split tensile and flexural strength of RCA concrete. Optimum dosage of GF was determined to be 0.25% for NCA, and 0.5% for RCA concrete respectively, based on the results of combined mechanical performance (MP).

Keywords: Fiber Reinforced Concrete; Recycled Coarse Aggregates; Glass Fibers; Mechanical Properties; Tensile Strength; Flexural Strength.

1. Introduction

Concrete is used more than any other manmade material in the world due to its unique advantages. Formability, high strength (in compression), durability, and the cost-effectiveness of OPC concrete make it more adaptable material than any other conventional material such as wood, steel, bricks, stones, etc. Though concrete has a high compressive strength, but it is brittle and fragile in both tension and bending. Its tensile strength in most of the cases is less than 10% of its compressive strength and typically its tensile strength is neglected in the design of concrete structures [1]. Improving tensile and flexural/bending strength of concrete and minimizing its natural aggregate content can help to add more value to stature of concrete.

To address the lower performance of concrete in tension, different fibers has been used as reinforcement. Fibers of various kinds have been reported to decrease the crack proliferation not only in terms of width but also in numbers when compared to plain concrete. Fibers affect properties of concrete in both fresh and hardened states. Fibers affect workability, strength, ductility, and durability of concrete. But fibers are mainly used to enhance the structural performance of concrete. Fibers have been reported to decrease workability [2], therefore, to maintain workability higher dosages of plasticizers are employed. Various studies have shown that inclusion of fibers improves tensile strength,

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